Enterprise Resource Planning (ERP) System in Higher Education: A literature Review and Implications

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Abstract—ERP systems are the largest software applications adopted by universities, along with quite significant investments in their implementation. However, unlike other applications little research has been conducted regarding these systems in a university environment. This paper aims at providing a critical review of previous research in ERP system in higher education with a special focus on higher education in Australia. The research not only forms the basis of an evaluation of previous research and research needs, it also makes inroads in identifying the payoff of ERPs in the sector from different perspectives with particular reference to the user. The paper is divided into two parts, the first part focuses on ERP literature in higher education at large, while the second focuses on ERP literature in higher education in Australia.

Keywords—Enterprise Resource Planning System, Higher Education, Implementation, User level,

I. INTRODUCTION

IN recent years higher education has been strongly influenced by global trends, especially as a result of the call by governments for universities worldwide to improve their performance and efficiency [2]. Rising stakeholders' expectations (particularly students and governments), quality and performance requirements, and competitive education environments, along with decreasing governmental support, have pressured universities worldwide to adopt new strategies in order to improve their performance [12]. Consequently, the higher education sector has turned to Enterprise Resource Planning (ERP) systems in the hope of helping them to cope with the changing environment [27]. As a result, existing management and administration computer systems have been replaced by ERP in these institutions [31], to achieve more efficiency and accessibility for all members and improve end users performance by providing better managerial tools [21].

The amount of investment in these ERP systems has been substantial. In the last few years higher education institutions spent more than 5 billions in ERP investment. The aim of ERP implementation in universities is to provide colleges, schools and departments, with an enhanced ability for research and teaching at reasonable or low cost [38]. Unfortunately however, it has been claimed that as many as 60% to 80% percent of all ERP systems fail to meet expected outcomes [28], while other implementations did not improve performance with users explicitly expressing dissatisfaction with performance.

In light of these facts and due to the significant investments of resources made by organizations to adopt or shift to ERP system, researchers have a strong desire to explain the causes and the factors that lead to good performance with ERPs [20], what factors influence implementation success and failure and the reasons behind the problems that occur with the implementation of ERP systems [20], [1], [15].

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Previous research in this area has attempted to answer the above questions and/or find solutions to these problems at the organizational level. However, research at the user level and resulting aspects are still ambiguous and unclear.

Higher education institutions invest extensively in ERP systems but find it difficult to identify the derived benefits from these applications in terms of their employees' performance, which should be reflected in the organizational outcomes and services. Therefore, rigorous evaluation that captures ERP technology, users and organizational issues is desirable. To this end, a critical review about previous research in ERP system in higher education, with a special focus on higher education in Australian, is presented in this paper. This review will help to evaluate previous research and determine the research needs in this area and to identify the payoff of ERPs in this sector. Multiple perspectives are considered in this review, especially the user perspective.

II. SIGNIFICANCE AND CONTRIBUTION

ERP systems are often the largest software application adopted by universities with significant amounts allocated to their implementation. However, little research has been conducted about ERPs in a university environment, compared to other environments [29].

Universities differ from other organizations because they have different environments and circumstances, and they use ERP technologies for academic purposes [28]. Faculty and staff commonly interact with core institutional activities through ERPs, and students need more information and better E-learning environments. In sum, this means that the system is, by definition, critical to the institutions' mission. Furthermore, these organizations are governmental organizations and do business for profit and non-profit purposes, which might make ERP systems in these organizations with different concomitances especially with the high percentage of failure implementations.

All of these issues lead to critical questions about the success and the benefit of ERPs for theses organizations. The core part of these issues centralizes the study's aim on whether or not the system improves user performance, and also whether ERP systems meet staff requirements in higher education environments. Hence, studying the impacts of ERP systems on user performance is a significant way to assess the utility of these applications in higher education institutions and how they contribute to performance efficiency and effectiveness [4].

When ERP systems are fully realized in business organizations, they yield significant benefits [10], such as improved access to accurate and timely information [21], [19]. However, higher education institutions do not realize the significance of the ERP systems because of the very few successful implementations and adoption of these applications. For example, in Australia a recent study conducted by [13], found that very few ERP system projects implemented successfully. Furthermore, when an information system implementation fails, one cause may be its inability to meet the expectations of its stakeholder groups [35]. Therefore, providing

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knowledge about the fit between ERP applications and users' needs in these institutions should help to at least avoid any failure caused by mismatches between the system and users' needs.

III. LITERATURE REVIEW

There have been numerous studies on ERP implementation and several related issues such as implementation procedures, business process and outcomes (e.g. [22], [24], [25], [14], [32], [33], [3] [34]. Although these studies discuss many important issues in detail, even vendor selection and implementation team, research about ERP system in higher education is still at the infancy stage.

Indeed, existing ERP research has neglected the higher education sector worldwide, even though most universities have implemented or are in the process of implementing an ERP system [29]. Thus research in issues related to ERP and users in higher education represents a forward step in analyzing the actual benefits potentially brought by these systems to organizations.

Although ERP systems in higher education institutions currently represent their largest software investment, it is not likely to be the final one. Universities are planning to renew and install other enterprise–wide systems in the future [29], this necessitates the call for more research efforts in this area.

As mentioned previously, researchers have studied ERP in various contexts and situations, and in various industries [39]. Specifically, within the context of in the higher education sector some studies have been conducted for varied purposes, with most of the studies aimed at evaluating ERP implementation success and outcomes in terms of the invested outlay, or issues regarding implementation failure. [21], conducted series of studies to assess ERPs in higher education and their associated benefits with a focus on process performance and the effect of factors such as culture and leadership on process performance in an ERP system environment. These studies concluded that ERP systems were implemented to improve services for students, faculty and staff. However, 50% of these implementations went over budgets and over timeline schedules. Although these studies did not give attention to user perspectives, they raised awareness and made some important contributions about ERPs in a significant environment (Higher education institutions) which represents one of the most important sectors that invested in ERP to achieve valuable outcomes from that investment.

Researchers recently began to investigate which factors are important when implementing ERP in higher education and which factors lead to success or failure. For instance, [38], mentioned that staff training is very important process when implementing ERP in higher education in order to reap more benefits from these systems.

[17], investigated the impacts of ERP system on business process and performance in higher education. The key questions of his study addressed whether or not ERPs enhance performance process and looked the roles of factors such as leadership and culture and their effects of ERP and business performance. The study concluded that ERP potentially improves business performance in higher education by enhancing services offered to students, faculty and staff.

[2], conducted a study in four UK universities to investigate the effect of ERP implementation in higher education. The study found that organizational culture and communication have significant effects on the implementation outcomes of ERPs in higher education in the UK.

[28], studied the impacts of leadership and culture on implementation of ERP systems and their significance in predicting performance in higher education. The results show that organizational culture has a little impact on the success of ERP implementation and the combination of these elements was not associated with successful performance.

[37], investigated factors affecting the success or failure of the implementation process Enterprise Systems. The study found that, factors such as change management, behaviour management emotions, communication, and the implementation process approach and system functionality had profound effects on implementation success. The study also discovered the impact the functionality offered by an ES had on the usage of the system by the users, leading to the belief that system aspects must be taken into account when investigating ERP system.

ERP In Higher Education In Australia

Over the last twenty years and into the foreseeable future, Australian universities have been and will undergo major changes. Universities have been under more pressures as a result of increasing number of students and increased government pressures to reform their structures, lower their costs and achieve greater administrative efficiency [7]. The Australian government has pressured universities into acting more like businesses, as the level of funding has significantly reduced [29].

The introduction of the ERP in higher education in Australia has resulted in yet a further layer of change in universities to replace old administrative and management systems with new ones [7]. However, one of the reasons that universities have adopted ERP systems is to improve performance and learning services, and also to become more efficient in their operations [12], in part to deal with the range of other changes they have been facing. Consequently, universities began to implement ERP systems to replace old and outdated systems with more efficient ones [23], [11].

In the process, ERP systems have become a standard feature of most Australian higher education institutions. To date, most of the literature on ERP implementation in the Australian higher education sector has focused on the early stages of the ERP lifecycle: adoption decision, acquisition and implementation. Furthermore, in higher education institutions that have invested in ERP systems, the magnitude of the implementation project easily becomes the biggest information system project in the organization's history [29].

Back to the point, little research effort has been undertaken on this particular topic. Specifically, research that focuses on an Australian environment has been neglected, especially when it is understood that more than 85% of Australian universities have implemented ERP systems [6].

Most of the literature on ERP and higher education in Australia has focused on failure and success factors because many implementations have been reported as failures cases in Australian university as mentioned previously. The lack of functionality of the implemented system has been shown to be one of the most important factors reported in this area [12], [29]. However, none of the previous studies have delved further into an explanation about why this is the case. This study investigates the quality of ERP systems and their outputs as major factors of the system's functionality.

[7], conducted a survey to research the rate of adoption of ERPs in Australian higher education. This research discussed the status of ERP's in Australian universities and has provided an increased awareness of the extent of the adoption of ERP technology by universities, with the modules adopted being human resources, financials and student administration.

[29], investigated the critical success factors for implementing an ERP system into an Australian university environment. The study gave evidence of a lack of research on ERP implementations within an Australian university environment. The study also proposed a diversity of opinion amongst people on whether the ERP implementation project had been a success or not. Therefore, getting different viewpoints about ERP systems implementation successes

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seems a significant matter leading to more meaningful results concerning the higher education environment as been considered in this study.

[30], examined the rationale employed by universities as ERP adopters. The study outlines the significance of ERP systems and analyses the rationale used for their adoption. The data used for the study take the form of documents published electronically on the Internet by universities. The study identified the main reasons for adoption to be the modernization of systems, greater usability and flexibility, integration of data and systems, business process reengineering, an increase in the degree of electronic data interchange (including the provision of Web-based interfaces to application systems), reduced maintenance and risk avoidance.

Researchers in this area have investigated ERP in terms of cultural constraints to gain some knowledge about its importance regarding implementation success and failure issues. [36], investigated the cultural influences on ERP implementation in a large Australian University. The study concentrated only on factors influencing the post-implementation stage of ERPs life cycle. The study identified the importance of cultural influences on user satisfaction with implementation, stated thing that during a technology's implementation, the management of human and organizational risk is not only more difficult that managing the technical risk, it is crucial to the success of the implementation.

[26], examined the effect of sub-cultures on the implementation of ERPs in an Australian regional university. The results demonstrated that all sub-cultures, except the academics themselves, perceive that the academic sub-culture holds the power to influence the success or failure of change. Many staff asserted that benefits from the ERP systems will be achieved not through autocratic leadership but through the executive driving a common vision and empowering staff. However, the findings show that for change to be successful the needs and values of sub-cultures must be recognized or individuals will create barriers to change.

[12], examined staff perceptions about issues that influence the implementation of ERP systems in three Australian universities. The study identified the influences impacting on the outcomes of the implementations and forms the basis for the development of guidelines for the effective and efficacious management of ERP implementations in Australian universities. The study also stated some important indicators of resistance when applying new systems, such as poor cooperation in dealing with problems. In brief, the study investigated staff perception about issues of significance during ERP system implementation.

IV. DISCUSSION

The failure rate of ERP implementation is very high, among other obstacles we find that, technical problems, and critical factors including top management support, training and people obstacles have been cited as major barriers [8]. Hence, over the past decade researchers have become interested in ERP systems, especially in their failure factors. As a result previous work concentrated extensively on those factors that critically affect ERP implementation and contribute to system success. This trend has continued to the detriment of investigations into user aspects as implementation success factors.

To further understand the ERP implementation impacts on organizations, this research attempts to evaluate actual impacts of ERP system on its user performance by using a well-established theoretical framework. This starts from the proposition that information systems cannot by themselves affect productivity, with the main efficiency factor lying in the way people use these technologies [5]. Thus the system users become one of the most important factors in creating benefits from these technologies. As

such, this notion should be given substantial attention in order to more fully understand the ERP technologies and how these technologies can improve organizational performance. However, there is a lack of empirically supported research on ERP system and user performance issues. This absence is the main motivation factor to evaluate the impacts of ERPs on user performance by surveying higher education institutions from the user's point of view, recognizing the user as the instrument that drives ERPs value and with a strong belief that ERP users are indeed a significant factor driving implementation success and that lack of care about ERP system users can lead to implementation failure [5].

Although lagging behind other industries, the use of IS (Information Systems) in higher education has increased. However, organizations have not fully embraced the valuable resource of ERP systems. Thus, to realize the potential outcomes and benefits of ERPs within these organizations, research into user performance, system use and IS fit has been necessitated and urgently required.

More specifically, most of the previous studies either have more theoretical concentration or investigate implementation issues such as user acceptance, or evaluate the implementation success of the ERPs in general. To the best of our knowledge none of the previous studies have tried to collect what we perceive to be the most important factors which affect user performance from user perspective, or the impacts of ERP systems on user performance at the individual level.

In short, previous studies have shaped many aspects of the knowledge base in this part of the IS field, ranging from success factors, implementation processes, challenge factors, organizational benefits and user acceptance. However a knowledge gap still exists regarding user performance and ERP applications; this has been almost ignored in previous studies irrespective of some studies that tried to evaluate highly targeted special groups performance in different types of organizations.

Accordingly, it seems that the combination of different evaluation variables and their subsequent classification into structured dimensions and factors can contribute to shape a comprehensive model which helps to fill an essential part of the knowledge gap, and represents a further step in investigating ERPs and their impact in higher education institutions and IS theory as well. Thus, as the focus ERP evaluations is broadening from technical aspects to include human, organizational and technological aspects as well, the importance of ERPs and their effects on user performance will be realized, and thus the extent to which ERPs fulfill their role for target organizations will be recognized.

V. CONCLUSION

The benefits and impacts provided by ERP systems need a rigorous evaluation. Most existing evaluation studies of ERPs focus on technical issues or implementation processes, these do not provide an explanation about ERPs effects, or if ERPs work well or poorly with a specific user in a particular setting. Thus, evaluating the most critical factors that potentially determine the impacts from these systems is highly desirable in order to explain the actual benefits that could be achieved through these systems by users and organizations since they could affect educational outcomes and delivery.

The omission of a comprehensive model to evaluate the impacts of IS and its dimensions on user performance is still as an inherent problem in the IS field. This renders imperative the need for a sound academic study especially in higher education organizations, which increasingly invest on a daily basis in ERPs to improve performance and outcomes.

Similarity based on this literature review the analysis of user aspects has been absent due to a lack of conceptual frameworks,

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complexity of the sector, and complexity of the relationships between ERP systems and performance as said previously.

In brief, demonstrating the benefit and impacts of ERPs is becoming unavoidable from both academic and practical perspectives, due to the effect on individual performance, the high costs of these applications and the effects on educational services and outcomes.

Through the previous discussion, the importance of ERPs and the need for more studies have been emphasized, especially those studies that contribute to the critical role of ERPs. Also a matter of urgent concern for both IS researchers and practitioners have been addressed [18]. Thus, there are many reasons to motivate studies on ERPs in the higher education sector especially in Australia, where these systems are undergoing substantial change, adoption and use.

VI. FUTURE DIRECTIONS

Higher education institutions are persisting in the IS era by adopting and implementing ERP system. The need to evaluate their benefits and impacts on organizations and individuals are increasingly essential. Employing IS in this sector is very critical to its success and its efficiency of services as ISs are critical factors that affect staff, tasks and quality of services and outcomes. Importantly, with increasing investment in IS applications by these organizations and despite the successes of IS research, several important issues and obstacles to assessing and evaluating IS impacts and outcomes remain.

On the other hand, the lack of conceptualized frameworks and the critical call for validated measures necessitate more research in this area in the form of further research examining the fit between ERPs and their outputs, and the task requirements in higher educations institutions. This could potentially help organizations and practitioners, including vendors, to find reasonable answers and explanation to the history of failure of ERP system in higher education.

To this end, such an investigation will help higher education organizations, as practitioners and ERP professionals, shift their attention from success and failure factors only, to more important elements such as users, task and system, and also shift their deliberation to how these elements can increase the benefits of ERPs.

Finally, this paper suggests that researchers need to move the focus from technical and organizational perspectives to user perspectives as well as from implementation and success factors to more important issues related to users that create value and outcomes from ERP systems.

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